Polio Immunization: Moving Forward

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Immunogenicity of IPV-containing vaccines in tropical countries

Three decades of experience

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Data base (as of Sept 2007)

- **54 trials (70 study arms) done with IPV-containing vaccines in 24 tropical countries since 1977**
  - **30 studies done in Low Income countries**
- **Several types of design**
  - **Comparative between IPV-containing vaccines and OPV**
  - **IPV schedules comparison**
  - **Mixed or sequential IPV / OPV schedule evaluations**
  - **Dose response for IPV or IPV cell substrate origin comparison**
  - **Descriptive licensing studies**
- **Several IPV-containing vaccines**
  - **Precursors of the 2nd gen. IPV**
  - **IPV standalone**
  - **wcP-based combinations**
  - **acP-based combinations**

GMT & % with SN titers ≥1:8 induced by the 6-10-14 weeks schedule (polio type 1)

Country / Yr	Product	Nb	Pre Dose 1	Pre Dose 3	Post Dose 3	Pre Booster	Post Booster
South Africa 1998	DTwP-IPV-Hib	119	20.3 (63.1%)		116 (99.2%)		
Philippines 2000	DTaP(5)-IPV-Hib	65	34.5 (81.5%)	285 (98.5%)	863 (100%)	1034 (100%)	3104 (100%)
South Africa 2001	DTaP(2)-IPV-Hib-HepB	213 225	7.8 (51.3%) 7.8 (49.2%)		1226 (100%) 1302 (100%)	154 (100%) 159 (99.5%)	6383 (100%) 6455 (100%)
Philippines 2003	DTaP(2)-IPV-Hib	192 174	10.2 (58.0%) 9.0 (53.6%)		533 (100%) 574 (100%)	78.4 (95.9%) 81.3 (97.2%)	10377 (100%) 9436 (100%)
South Africa 2005	DTaP(2)-IPV-Hib	202			1453 (100%)		
India 2005	DTaP(2)-IPV-Hib	213	18.1 (74.6%)		440 (100%)		

Polio NID between post-dose 3 and pre-booster

GMT & % with SN titers ≥1:8 induced by the 6-10-14 weeks schedule (polio type 2)

Country / Yr	Product	Nb	Pre Dose 1	Pre Dose 3	Post Dose 3	Pre Booster	Post Booster
South Africa 1998	DTwP-IPV-Hib	119	23.1 (63.1%)		93 (99.2%)		
Philippines 2000	DTaP(5)-IPV-Hib	65	36.4 (81.5%)	256 (98.4%)	768 (100%)	1647 (100%)	6367 (100%)
South Africa 2001	DTaP(2)-IPV-Hib-HepB	213 225	16.0 (72.6%) 14.1 (68.5%)		661 (100%) 694 (100%)	222 (99.5%) 220 (98.5%)	9671 (100%) 9537 (100%)
Philippines 2003	DTaP(2)-IPV-Hib	192 174	14.7 (64.9%) 19.5 (74.9%)		789 (100%) 719 (100%)	139 (94.8%) 130 (97.2%)	12117 (100%) 10171 (100%)
South Africa 2005	DTaP(2)-IPV-Hib	202			1699 (100%)		
India 2005	DTaP(2)-IPV-Hib	213	20.4 (74.2%)		458 (99.1%)		

Polio NID between post-dose 3 and pre-booster

GMT & % with SN titers ≥1:8 induced by the 6-10-14 weeks schedule (polio type 3)

Country / Yr	Product	Nb	Pre Dose 1	Pre Dose 3	Post Dose 3	Pre Booster	Post Booster
South Africa 1998	DTwP-IPV-Hib	119	16.0 (46.7%)		166 (99.2%)		
Philippines 2000	DTaP(5)-IPV-Hib	65	13.5 (76.9%)	403 (96.9%)	901 (100%)	1873 (100%)	6158 (100%)
South Africa 2001	DTaP(2)-IPV-Hib-HepB	213 225	4.8 (30.4%) 5.0 (49.2%)		1249 (100%) 1424 (100%)	202 (97.8%) 212 (97.0%)	11332 (100%) 10377 (100%)
Philippines 2003	DTaP(2)-IPV-Hib	192 174	10.4 (58.3%) 10.1 (55.5%)		1968 (100%) 1571 (100%)	128 (99.5%) 112 (100%)	13303 (100%) 11514 (100%)
South Africa 2005	DTaP(2)-IPV-Hib	202			2398 (100%)		
India 2005	DTaP(2)-IPV-Hib	213	9.9 (61.5%)		1510 (100%)		

Polio NID between post-dose 3 and pre-booster

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What is required for vaccine manufacturers to produce IPV for developing nations in a cost-effective manner?

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A sized bulk antigen manufacturing unit

- A BSL-3 bio-contained unit
- A licensed robust scaled-up process
- A well in advance planed demand to take into account a product cycle of 7-9 months for the bulk antigen (concentrated trivalent inactivated purified poliovirus)
- GSK, NVI and sanofi pasteur maximum capacities (~500 M doses/yr) (IABS, Toronto, June 2005) could meet worldwide needs
  - The ramp up of this capacity need a long-term view of the demand
  - Step wise increase of capacity according to investments
    - Operator recruitments & organizational changes
  - Safety stocks of the different intermediates to be built

Sized Formulation, Fill and & Packaging units

- **Standalone polio vaccine or multivalent IPV-containing combination vaccine**
- **Multi-dose vials or syringe**
- **A product cycle of 12-14 months for the Finished Product (released by the manufacturer and the National Control Laboratory)**

- **Currently, the vast majority of IPV is delivered through pentavalent combination vaccines**
  - **Ease acceptability of additional injections**
  - **Minimize the impact on price**
  - **Future low-priced acP combinations**

Partnership with local manufacturers

- **The dilemna between the post-eradication bio-safety BSL-3 containment requirements and the creation of new IPV bulk antigen manufacturing units**

- **Possibility of transfer of FF&P activities more feasible, but complexity depends on products and countries**
  - **IPV-containing combinations are difficult Drug Products to formulate and to release**

Pre-requisites to ensure IPV production for developing nations in a cost-effective manner

- **Installed capacity**
  - **Already in place thanks to the investments made over the last years**
- **Capacity utilization that is a function of:**
  - **Timely decision (cf. cycle time)**
  - **Volume forecast (direct impact on pricing)**
- **Clear communication of volume & planning allows**
  - **Ramp-up**
  - **Further investment decisions**
- **Progressive IPV introduction starting now is the best way to ensure that production capacities will match future global demand**